REMARKS/ARGUMENTS

In response to the outstanding Office Action, Applicant presents the following arguments for patentability of the claims.

In the Office Action, the Examiner stated that Feucht discloses, among other things, "a controller ... controlling the valving to couple the source of fluid under pressure to the hydraulic actuator until the engine valve stops at an engine opening at which the return force urging the engine valve toward the open position exceeds the hydraulic force urging the engine valve toward the closed position, then blocking fluid flow." This is not correct. In particular, in Feucht, the engine valve opening sequence after coupling the cavity 130 to the high pressure fluid source 28 is described as follows:

> "Referring more specifically to FIG. 2, during the initial portion of the plunger 54 movement from the first position to the second position, high pressure fluid from the high pressure fluid source 28 is communicated to the plunger cavity 130 through the primary flow path 148. The high pressure fluid unseats the first check valve 174 allowing the majority of high pressure fluid to enter the plunger cavity 130 around the first check valve 174 through the relieved outside diameter of the stop 180 at a rapid rate.
>
> As the plunger cavity 130 fills with high pressure fluid, the plunger 54 moves rapidly downward opening the valves 16 against the force of the springs 18. As the plunger 54 moves downward, the position of the annular cavity 168 in relation to the main port 164 is constantly changing. The downward motion of the annular cavity 168 allows fluid connection between the annular cavity 168 and the restricted port 190, thereby allowing high pressure fluid to enter the plunger cavity 130 through both the primary and secondary flow paths 148,152.
>
> As the annular cavity 168 moves past the main port 164 in the terminal portion of the plunger movement, as can be seen in FIG. 3, fluid communication is restricted and eventually blocked by the outer periphery of the plunger 54 so that all fluid communication between the high pressure fluid source 28 and the plunger cavity 130 is through the restricted port 190. Since the diameter of the restricted port 190 is smaller than the main port 174, downward motion of the plunger 54 is slowed, thereby, reducing the velocity of the valve 16 as it reaches it full open position.
>
> As the annular cavity 168 moves past the restricted port 190, fluid communication is restricted and eventually blocked by the outer periphery of the plunger 54 which allows the plunger 54 to hold the valve 16 at its maximum lift position. As leakage occurs within the system, the plunger 54 will move up and slightly re-open the restricted port 190 and, therefore, recharge the plunger cavity 130 causing the plunger 54 to move back down. The valve 16 open position is then stabilized around the maximum lift position by the small movements of the plunger 54 opening and closing the restricted port 190." (col. 5, line 60 to col. 6, line 23)

Thus it is clear that in Feucht, the engine valve stops at the "maximum lift position" by decoupling the plunger cavity from the source of high pressure fluid, and that at the "maximum lift position", the engine valve opening force due to the high pressure fluid, when coupled to the cavity 130, must exceed the engine valve closing force of the return spring, as otherwise it would be impossible to accommodate leakage as stated, specifically "As leakage occurs within the system, the plunger 54 will move up and slightly re-open the restricted port 190 and, therefore, recharge the plunger cavity 130 causing the plunger 54 to move back down. The valve 16 open position is then stabilized around the maximum lift position by the small movements of the plunger 54 opening and closing the restricted port 190." (col. 6, lines 17 to 23).

Claim 1 of the present application provides, among other things, for:

> "continuing to couple the hydraulic actuator to the source of fluid under pressure as the engine valve closing force of the return spring starts to exceed the engine valve opening force of the hydraulic actuator; and,
>
> decoupling the hydraulic actuator from the source of fluid under pressure as the engine valve stops at an engine valve opening wherein the engine valve closing force of the return spring exceeds the engine valve opening force of the hydraulic actuator."

Because "the engine valve stops at an engine valve opening wherein the engine valve closing force of the return spring exceeds the engine valve opening force of the hydraulic actuator", opening any flow area between the hydraulic actuator and the source of fluid under pressure would not compensate for leakage, but in fact allow the valve to move toward a new stable position closer to the valve closed position.

Feucht discusses some of the advantages and requirements of hydraulic engine valve actuation systems. One of the requirements not specifically addressed in Feucht is the limiting of energy dissipated in such systems. In a conventional cam operated engine valve system, at least part of the energy used to actuate the engine valves is returned to the system on valve closure. This is not true in hydraulic engine valve actuation systems, so one should not use more energy to open the engine valves than is necessary, as otherwise the potential gains in efficiency may be consumed in the hydraulic system. The present invention helps minimize the energy requirement of such systems by allowing opening the engine valves beyond what could be achieved by the respective source of high pressure fluid if that source of high pressure fluid needed to be high enough to hold the engine valve open in the presence of leakage.

Independent claims 7 and 13 claim the invention in alternate terminology, with the same comments applying to the patentability of these claims also. Consequently, reconsideration of the rejection of these claims is respectfully requested. Also, rejected claims dependent on these independent claims are also believed allowable as providing additional novelty and specificity to the claimed combination.

The present application has been filed in the PCT. Enclosed is a copy of the search report of the European Patent Office.

CONCLUSION

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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Dated: 08/16/2005

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